**Who’s Perfect?**

Some quadratic expressions have a special type of factorization, in which the two factors are the same. For example, x2 - 6x + 9 is equal to the product (x - 3)(x - 3), which can also be written as (x - 3)2.

Expressions such as x2 - 6x + 9, which can be written as the square of another expression, are called squares or perfect squares.

Your task in this assignment is to see which quadratic expressions are perfect squares. You should restrict yourself to quadratic expressions whose x2- coefficient is 1. That is, you want to find a rule that tells you whether an expression of the form x2 + bx + c is a perfect square.

1. Multiply out each of these expressions, look at the trinomials you get, and examine how the coefficients of those trinomials are related to the expression you are squaring.
   1. (x + 4)2
   2. (x - 5)2
   3. (x + 7)2
2. Generalize your work from Question 1. As needed, make up some more examples of your own and look for patterns. Then state a general rule that will tell you if a quadratic expression with x2- coefficient equal to 1 is a perfect square.

**More About Perfection**

1. In *Who’s Perfect?* you were asked to find a general rule that tells you when a quadratic expression with x2- coefficient equal to 1 is a perfect square. Explain that rule using an area diagram.
2. In each of these expressions, find a number for the constant term c so that the expression will be a perfect square. (This is called completing the square.)
   1. x2 + 6x + c
   2. x2 - 12x + c
   3. x2 + 9x + c
3. a. Make a table showing at least six number pairs that fit the equation y = (x - 3)2.

b. Plot those points and then connect your points with a smooth curve that you think represents the graph.

1. Repeat steps a and b of Question 3 for the equation y = (x - 5)2.
2. Repeat steps a and b of Question 3 for the equation y = (x + 7)2.
3. Generalize from the curves you got in Questions 3 through 5 to describe the graph of the function y = (x - h)2. Your description should include the coordinates of the vertex for the graph.